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Leading Community Risk Reduction

Defining Service Level Parameters for the Wheaton Fire Department

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed:_____

ABSTRACT

The problem was the Wheaton Fire Department (WFD) has evolved without the establishment of baseline parameters for measuring performance and capability which causes stakeholder uncertainty regarding Department performance and needs. The purpose of this research was to develop formal, baseline service level parameters for the WFD. The Action Research Method was used to obtain answers to questions related to defining service level parameters. The researcher collected information via Literature Review and the Results identified methodology, both internal and external to the fire service, for measuring service including an analysis of standards utilized by common fire service organizations and legal bodies. The basis of the Recommendations was to create service level parameters based upon commonalities of industry standards and applicable laws.

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INTRODUCTION

The Wheaton Fire Department (WFD) has a long history of providing a variety of services to its community. Unfortunately, the creation and implementation of these services have evolved without the establishment of baseline parameters for measuring performance and capability. The problem is the absence of these formal baseline parameters causes stakeholder uncertainty regarding the Wheaton Fire Department's true performance capabilities and overall needs for current and future operations.

The purpose of this research is to develop formal, baseline service level parameters for the Wheaton Fire Department. The following Applied Research Project (ARP) will address the establishment of these service levels parameters by first reviewing common methods for determining service level parameters both internal and external to the fire service and then by conducting an analysis of sources for American fire service industry standards. It is through this analysis that base service level parameters will be established for the WFD.

The action research method will be used for this ARP in order to solve the stated problem. The information will be used to develop a Policy outlining service level parameters for the Wheaton Fire Department. The Policy will be included as an appendix within the ARP.

The following research questions will be addressed through the presentation of the materials:

What are common methods used both in today's fire service and in private industry for determining service level parameters?

What service level parameters are outlined in the NFPA 1710: Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments for communities comparable to the City of Wheaton?

What service level parameters are outlined within the Insurance Services Office Public Protection Classification Program for communities comparable to the City of Wheaton?

What are the Federal laws that establish service level parameters for emergency service providers within the United States?

What are the State laws that establish service level parameters for emergency service providers within the State of Illinois?

How do the standards/laws outlined in the aforementioned research questions compare and/or contrast to one another?

What should be the service level parameters for the Wheaton Fire Department?

What are the potential impacts of the Wheaton Fire Department service level parameters on the organization and the community?

BACKGROUND AND SIGNIFICANCE

The City of Wheaton is a western suburb of Chicago, Illinois with an area of 11.6 square miles that has a permanent population of approximately 56,000 people and a daytime population that reaches 80,000 people. The City of Wheaton is a diverse community that is comprised of a balanced mixture of residential, educational, assembly, commercial, and light industrial occupancies. The City of Wheaton also serves as the

county seat for DuPage County and is the site of the County Complex that includes a maximum security prison, judicial buildings, healthcare facilities, and a fairgrounds area.

The WFD is an all hazards, emergency services organization that provides a wide array of services which include fire suppression, Advanced Life Support (ALS) emergency medical services, technical rescue, hazardous materials, disaster- emergency management along with fire prevention and public education activities delivered by both career and contractual employees. The Department responds to approximately 5000 requests for service annually with 70% of the requests being emergency medical related.

The WFD was chartered in 1894 as a volunteer organization. Over many years, the Department has evolved to attempt to meet the changing needs of the community. The transpiring evolution included staffing movements from volunteer to paid on call and from paid on call to career along with service alterations that threaded from fire suppression only services to a modern day, all hazards approach. The drive behind these changes has traditionally been from a reactionary approach rather than through planning activities coupled with the employment of data based decision making.

The WFD has operated throughout the years without forecasting mechanisms such as a strategic plan. Furthermore, until recently the Department did not utilize an organized data collection system to document activities and trends. As a result of these two short comings, difficult questions have been historically asked by policymakers but have been predominately left unanswered or unaddressed because of the lack of facts. Examples of these questions include:

Is another fire station needed for the City of Wheaton?

Does the WFD need additional staffing?

Does the WFD meet the needs of the community?

Does the WFD have high risk/high hazard areas within the community that are underserved?

Are WFD response times ensuring a safe and stable outcome for requests for emergency service?

The answers to these questions have been batted back and forth with information based upon hearsay and emotion.

In 2003, the WFD underwent a change in administration. The new administration received direction from the policymakers to make comprehensive administrative improvements for the organization. Included in these improvements were items such as engaging in planning activities and developing a reliable data collection system that can provide facts for decision making. Over the past several years the requested changes have been cultivated and are currently being implemented.

With this implementation process a significant deficiency was identified. The deficiency centers upon the lack of defined service level parameters to be used as a standard of measurement for answering the aforementioned and other questions that have been raised. Without the presence of defined service level parameters, the decision making process remains a broken chain. It has become evident that the organization cannot factually express it needs to the policymakers because of the absence measurement tools.

In years past, the organization has approached the policymakers with its needs primarily justified through dialog prefaced with “we feel” and “we think” that “we need to do x, y, or z”. In most cases, the policymakers had supported the needs because they

believed in the requests being presented to them. It is not to say that the needs were not valid. However, the supporting arguments were in most cases presented without fact and relayed based upon emotion.

As the result of various dynamics which include economic constraints and heightened public perception of public safety, the City of Wheaton policymakers are now mandating that WFD needs be expressed and justified in terms of facts and that the facts be correlated to a standard of measurement. Emotion based arguments are no longer acceptable.

The answers to the planning questions raised need to be answered in terms of true performance. With defined service level parameters, a question simply stated as "Are we meeting the service needs of the community?" can be answered with "our service level parameter is x, y, and z. Our performance is currently a, b, and c which is below our stated parameters thus requiring us to take _____ action" or "our performance is currently a, b, and c which meet and/or exceeds our stated parameters and therefore requires no further action at this time". It is the goal of both the City of Wheaton policymakers and the WFD administration to engage in the decision making process in this fashion.

The administration, of both the WFD and the City of Wheaton, has discussed the need to develop standards of response coverage for the City of Wheaton. A review of the *Standards of Response Coverage* document from the Commission of Fire Accreditation International, Inc. identified that while the process would yield valuable information, it would be extremely resource intensive in order to obtain valid results. Therefore due to the current level of administrative staffing for the WFD and the need to address other

critical areas of the Department, the Department would not embark on the process to create Standards of Coverage at this time. As an alternative and as part of an effort to create a starting point for measurement, the administrations have agreed to establish service level parameters based upon an assessment of other common sources and methods identified from across the fire service.

The topic of this ARP has a direct correlation to the section entitled *Unit 5: Action Plan* covered during the October 2005 Leading Community Risk Reduction course. In specific terms, the course covered information related establishing evaluation milestones. In the context of the course, the milestones are used to measure performance as it relates to the implementation of risk reduction plan but there was an ancillary theme of utilizing measurement standards for determining organizational effectiveness and efficiency. According to the text, "benchmarks are a form of an evaluation, an opportunity to measure how well you are doing" (Federal Emergency Management Agency [FEMA], 2004, p. 5-29).

Furthermore, the topic of this ARP correlates to the fifth organizational objective of the United States Fire Administration's (USFA) five-year operational objectives which state "to respond appropriately in a timely manner to emerging issues" (FEMA, 2003, p. II-2). The issues associated with the lack of service level parameters have direct and immediate impact on the services provided to the community. The deficiency greatly limits the Department's ability to accurately assess current abilities and employ planning mechanisms that will address the needs for the future.

LITERATURE REVIEW

The Literature Review related to this ARP was primarily conducted at the NFA Learning Resource Center (LRC) in Emmitsburg, Maryland. However, several other supporting materials were obtained and reviewed from the internet.

The Literature Review for this project identified that there is extensive literature related to the topic of defining and measuring levels of service. The intent of the review was to identify the background and concepts of defining service level parameters and how they specifically apply to the public sector in order to develop a guide for obtaining the answers to the Research questions outlined in this ARP.

The first research question identified for this project is centered upon the concept of identifying common methods for determining service level parameters. In order to understand the methods, it is also pertinent to identify the reasoning, justification, and issues related to creating service level parameters along with a broad definition of service level parameters. For the sake of this writing, it is important to mention that performance and service should be considered interchangeable.

A good starting point for obtaining background on service level parameters is to look at the private sector. In the business world, performance measurement can be tied to several areas: costs, profits, and customer satisfaction. Performance measurement practices are employed in business for such things as to gauge improvement both before and after the implementation of programs. According to Kurtus (2000), “to improve your business, you must be able to truly verify that improvement” and that “specific measurements are used to find where bottlenecks are and to allow for fine tuning” (¶ 1). Additionally, it is suggested that performance measurement be tied to a model of

management such as management by objectives and that “in order for it to be effective, the system must be part of the (corporation) strategic plan” (Business Performance Measurement, 2005,¶ 1).

Performance measurement or service level parameters in the business world have a direct impact on the main purpose of business which is to make profits. It is interesting that even within the business community, much like the fire service, opinions can vary on what the measuring stick should be to gauge performance.

An example of this can be found with business writer and economist Peter F. Drucker (2003). In his article entitled *Measuring Business Performance*, he debates the validity of using earnings per share versus return on assets as measurement points for business performance. While the details of his argument are focused directly on business practices and do not necessarily shed light on service level parameters in general, the information brings to light the struggle of determining which parameters are appropriate.

From the business world, the view now shifts to other entities external to the fire service, such as the federal government, for further insight into the question. In the report *Serving the American Public: Best Practices in Performance Measurement* (National Performance Review, 1997) issued by former Vice President Albert Gore’s National Performance Review, the principles behind performance measurement are discussed in great detail. The report justifies performance measurement through statements such as “leading edge organizations, whether public or private, use performance measurement to gain insight into making judgments about the effectiveness and efficiency of their programs, processes, and people” and also as a “methodology for organizational improvement” (National Performance Review, 1997, p. 4).

The report suggested that an organization measure its performance in regards to categories such as finances, customer service, internal operations, and stakeholder satisfaction. Furthermore, it is important to not only identify the categories of performance but also to establish baselines in each area and collect data for comparison. A quote listed in this report from a source noted as "anonymous" best summarizes the reasoning for performance measurement (or what this author is purporting as defining service level parameters) as follows: "without a yardstick, there is no measurement; without measurement, there is no control" (National Performance Review, 1997, p. 13).

The focus regarding the first question will now transition to the fire service. Before honing in on the American fire service, it is pertinent look at a brief example of how a fire service entity from another country views the concept of defining service level parameters. The literature review identified that this concept is as difficult for the global fire service as it is for the American fire service. Henrik Jaldell (2003) noted that problems for the European fire service related to performance measurement included "finding data for relevant, continuous output variables" and the difficulty of "specifying what the fire service actually produces" (¶ 1).

Furthermore, Jaldell (2003) identifies that for the European fire service there had not been an industry wide agreement regarding the definition of output for their fire service. Interestingly enough what they have used is parameters based upon insurance related values and that studies relative to their fire service have measured fire suppression output in terms of response time, spread of fire after the arrival of the first unit, and the value of property loss. The main point gleamed from this particular information is that not only does the European fire service have difficulties identifying performance

measurement parameters , but its needs to define them is also identical to that of the American fire service in that they have a need to measure efficiency and productivity due to a constraining fiscal climate.

Now with some of the background laid from areas outside the American fire service, the attention can be focused internally. The American fire service has varying practices and issues related to defining service level parameters. Much of the literary information had re-occurring themes related to the National Fire Protection Association (NFPA) standards, Insurance Services Office, legal requirements, and the practice of creating Standards of Response Coverage.

A significant number of the literary sources outlined information tied to methodology and justification of service level parameters. Moeller (2005) wrote regarding response time performance methodology that fire departments analyze performance through a comparison to similar agencies which is commonly termed as *benchmarking* or they evaluate agency compliance with national standards. In support of the concept of benchmarking, Janing (2003) identified that one of the five keys to a quality organization is "to establish concrete standards of service and regular measurement against those standards" (p.3).

The justifications continue with Begnell's (2001) theory that, "performance measures or standards are intended to define a level of effort or accomplishment" (p.72). Another perspective for justification approaches the matter from a problem solving direction. According to Meng (2005), "the first part of defining a performance problem is to have a standard of performance" (p.60). The justification for the American fire service to define service level parameters can best be summed up by stating that "it's

good to know your capabilities and short comings, especially if it leads to the delivery of better fire rescue services" (Bryson, 2002, p. 27).

The common emergency response service level parameters for the American fire service can be categorized into two general areas best described as time and resources. It is believed that "response time is the single key operational measure used to assess system performance from the citizen's perspective" (Fitch, 2005, p. 47). The resource category is clearly outlined in both the NFPA 1710 standard and Insurance Service Office rating schedule in terms of manpower (quantity and level of training) and equipment type.

During this literature review, technical information related to service level parameters was gathered from NFPA 1710 Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (National Fire Protection Association, 2004), Insurance Services Office fire suppression rating schedule (Insurance Services Office, 2006), Federal laws which included the Occupational Safety and Health Administration law for Response to Immediately Dangerous to Life and Health Atmospheres (Respiratory Protection, 1999), and State of Illinois statutes including Illinois Administrative Code regarding emergency medical services (Emergency Medical Services and Trauma Center Code, 1997) and Illinois Compiled Statutes governing fire departments (Fire Protection, 1995).

Examples of the technical information obtained include response time minimums for categories of service, manpower requirements, and resource criteria. The *Technical Information Table* (Appendix A) provides a columned breakdown of the information

gathered from NFPA 1710, Insurance Services Organization, Federal laws, and Illinois statutes.

Finally, in the spirit of the benchmarking concept, information related to some random American fire service findings, practices, and statistics were obtained to assist in a general comparison of service level parameters to national and industry related common practice. The information is listed as follows:

1. "Regardless of the region, season, or time of day structure fire response times are generally less than 5 minutes less than 50% of the time and nationally the average response times were generally less than 8 minutes". (Federal Emergency Management Agency, 2006, p. 1)

2. "In urban areas, the most widely used ambulance response time standard is 8:59 seconds with 90% compliance reliability based upon a fractile measurement, not average, basis". (Fitch, 2005, p. 48)

3. Boston Globe correspondent Bill Dedman cited several distinct findings and statistics in his articles contained in the 2005 special report on fire department performance. His findings included:

> Once a day on average in this country, someone dies when firefighters arrive too late and that America's fire departments are giving fires a longer head start, arriving later each year especially in suburbs where growth is brisk but fire staffing has been cut. In the 1970's, scientists at the National Institute of Standards and Technology found that after a fire breaks out, people have about 17 minutes to escape before being overcome by heat and smoke. Today, the estimate is 3 minutes. In addition, as response time lengthens the average property damage

> in a house fire steps up quickly – from $27,000 at 3 minutes response time to $41,000 at 7 minutes response time. (Dedman, 2005)

4. "Staffing levels for major metropolitan cities in the U.S. range from one to three firefighters, with an average of 1.5, per thousand (population). It has been demonstrated that when staffing falls below four firefighters per company, critical fire ground operations are not carried out when needed." (NFPA, 2003, p. 7-22)

5. The 2002 United States Fire Administration report on fire service needs identified the following facts:

> Using the maximum distance guidelines from the Insurance Services Office and simple models of response developed by the Rand Corporation, it is estimated that three-fifths to three-fourths of fire departments have too few fire stations to meet the guidelines. Also, the average number of Career/Paid firefighters per Department on duty available to respond to emergencies in communities of population range 50,000 to 99,999 is twenty four. (Federal Emergency Management Agency, 2002)

It is through the inclusion of these points that a general pulse of the American fire service can be used to broaden the performance perspective in addition to the technical information that is outlined in formal standards and legal sources.

Literature Review Summary

The literature review identified a variety of resources both fire service and non-fire service related that build a foundation for the answers to the research questions. The literary sources definitely reinforced this author's experience and beliefs related to the problem outlined in this ARP. The sources not only supported the need for developing

service level parameters but they also identified multiple methods and/or baselines for those parameters. It becomes evident through this review that the parameters for the Wheaton Fire Department will be built upon the commonalities of different recognized sources such as the National Fire Protection Association, Insurance Services Organization, and applicable laws.

PROCEDURES

After selecting the topic and receiving appropriate approval the following Procedures were employed for the development of this ARP. Research related to the selected topic was conducted through the Learning Resource Center at the National Fire Academy and appropriate literary resources were assembled for use during the Literature Review.

With the resources collected, a detailed Literature Review was conducted. Throughout the process, appropriate segments of the literary source were highlighted for points of application and/or consideration. The collected literary sources were then prioritized based upon their relevance to the topic. The highest prioritized items were numbered sequentially and a summary sheet of pertinent information was created for reference during the preparation of the project.

The Literature Review played a major role in completing this project. It is through the Literature Review that the author not only obtained findings of others but it also provided technical information used as the basis for the Action research component.

Upon completion of the Literature Review, a rough outline for the project was drafted and the content of the ARP was assembled in draft form based upon the Executive Fire Officer Applied Research Guidelines. The Action research component, a

Service Level Parameter Policy (Appendix B), was created as part of the drafting process. Upon completion of all report parts, the draft ARP was then reviewed by several parties related to this author and comments were provided. The final ARP was developed and submitted to the assigned evaluator for review and grading.

The Procedures employed in this project were intended to meet both the Applied Research Guidelines and to provide a methodical process for ultimately developing a Policy and more importantly a tool that will be used to help shape the future of the WFD.

Limitations

A limitation related to this research was the focus on analysis being placed on the concept of benchmarking versus utilizing other known methods for defining service level parameters. An example of another method is the utilization of process and subsequent creation of Standards of Response Coverage. The author had knowledge of this method prior to entering into this project but purposely excluded the information because of limitations within the City of Wheaton to properly conduct the process. Hence, the scope of the Literature Review was tailored to other methods and sources not related to Standards of Response Coverage.

Another limitation applies to the review of the NFPA standards. Within its body of standards, NFPA has two standards that apply to organization and deployment. The two standards are NFPA 1710 and 1720. The difference between the two standards is that NFPA 1710 applies to career fire departments and NFPA 1720 applies to volunteer organizations. Since the WFD is an all career fire department, the research involving the NFPA standards was limited to NFPA 1710.

Finally, the overall intent of this project is to define service level parameters for the WFD in the area of deployment which is inclusive of time and resources specific to the Department. The review of the information from the Insurance Services Office was focused on the sections specific to the fire department and did not include the sections on water supply and communications because both of these areas are under the authority of agencies outside of the WFD.

Definition of Term

Benchmarking: To identify the highest achievable standard and then attempting to meet or exceed that standard. (Janing, 2003)

Response Time: The time that begins when units are en route to the emergency incident and ends when units arrive at the scene. (NFPA, 2004)

RESULTS

The results of this ARP were derived from the information collected and reviewed from the Literature Review. The first question of this ARP asks: "What are common methods used both in today's fire service and in private industry for determining service level parameters?" On the most basic level, the common methods can be best described in terms of making comparisons to known practices (What are others doing?) or industry standards which was commonly referred to as *benchmarking* in the literary sources**.**

In the private/business sector, the comparisons are conducted in order to analyze performance in areas such as the organizational level (measured by profits) and at the employee level (measuring their output). In this sector it was suggested that, "the focus should be on performance measurement as information, not measurement as control". (Business Performance Measurement, 2004, ¶ 1) The measurement activities are

employed to gauge programs, identify barriers, and assess compliance with strategic goals.

The fire service utilizes similar approaches to that of the private/business sector. It appears that the sheer number of fire service organizations defining service level parameters and utilizing measurement practices is relatively low. Dedman quoted Ronny J. Colemen as claiming that "one percent of fire departments have even a set standard" for measurement. (Dedman, 2005)

In light of this, the practices commonly used for defining fire service industry parameters have either been tied to benchmarking or through a customized approach such as that found in Standards of Response Coverage which it typically associated with an accreditation process. With a benchmarking approach, the parameters are drawn not only from other fire service organizations but also from known standards and law making bodies such as the NFPA or state governments. The parameters commonly measured are time and resources inclusive of manpower and equipment.

The second through fifth questions of this ARP are asking for specific technical information related to standards and laws as they relate to the City of Wheaton and WFD. With regards to standards, it was identified that the most prevalent sources came from the National Fire Protection Association and the Insurance Services Office.

Specifically, the NFPA has a deployment standard numbered 1710 for career fire departments. The purpose of the standard is to "specify the minimum criteria addressing the effectiveness and efficiency of career public fire suppression operations, emergency medical service, and special operations delivery in protecting the citizens of jurisdictions and the occupational safety and health of fire department employees" (NFPA, 2004, p.4).

The standard outlines recommendations such as the number of personnel needed to deliver services, time benchmarks for those services, and guidelines for operations.

The Insurance Services Office utilizes their Public Protection Classification (PPC) Program to "help establish appropriate fire insurance premiums for residential and commercial properties in order to provide insurance companies reliable, up to date information about a community's fire protection services". (Insurance Services Office, 2006, ¶ 1) The standards used in the PPC include measurement of a community's fire alarm and communications systems, the fire department's capabilities (staffing, equipment, training, and distribution), and a community's water supply system. It is applicable to reiterate that NFPA 1710 and the Insurance Service Office parameters are standards and not laws.

The Results on the law research associated with service level parameters began with information on the federal level. In regards to the time parameter category, the search of federal laws did not identify any specific time baselines for any emergency response incidents including fire, emergency medical services, technical rescue, or hazardous materials. However, there are several federal laws that are applicable to the resources parameter category. Specifically, resources are addressed in Code of Federal Regulations (CFR) legislation covering both Respiratory Protection and Hazardous Waste Operations and Emergency Response (a.k.a. HAZWOPER).

Under the provisions for Respiratory Protection legislation, the manpower resources are outlined through the requirements of two firefighters being present outside a building with the presence or potential presence of an immediately dangerous to life and health (IDLH) atmosphere before two firefighters may enter the atmosphere with the

exception of entry due to emergency rescue activities (Respiratory Protection, 1999). The HAZWOPER provisions do not specify exact numbers of total personnel but rather delineate specific roles that must be filled when addressing a hazardous substance emergency response (Hazardous Waste Operations and Emergency Response, 2002).

Examples of the roles to be filled according to the legislation include incident commander and safety officer along with a specification that "operations in hazardous areas shall be performed using the buddy system in groups of two or more" (Hazardous Waste Operations and Emergency Response, 2002). Neither of these laws delineates specific parameters for equipment resources and no other Results were obtained for any other apparent Federal laws that apply to service level parameters for the fire service.

It became apparent from the Literature Review that much of the legal definition of service level parameters is left to State and Local governments. In Illinois, specific legislation does exist for emergency medical services but not for fire related services such as fire suppression, hazardous materials, or technical rescue. In general terms, legislation in both the emergency medical services and fire suppression grant power to the corporate authorities to deliver these services. On the fire suppression side, that is where the legal parameters end. No reference is made to how the services should be delivered in terms of resources or time (Fire Protection, 1995).

In regards to emergency medical services, Illinois does have specific regulations pertaining to the category of time. The regulations are identified under the Administrative Rules pertaining to the Illinois Department of Public Health. The regulation outlining time states emergency medical service vehicles participating in the

system shall “commit to optimum response times up to six minutes in primary coverage areas”(Emergency Medical Services and Trauma Center Code, 1997, § e).

The Technical Information Table (Appendix A) provides a columned breakdown of the information gathered from NFPA 1710, Insurance Services Organization, Federal laws, and Illinois statutes.

While researching, two interesting facts were identified regarding the reasoning behind the time benchmark references for both fire and emergency medical services response. Fire benchmarks are typically tied to the time-temperature curve used to describe the behavior and progression of a structure fire. The most significant aspect of the time-temperature curve when discussing call response and resources is the flashover point. It has been scientifically proven that “within six minutes a room of origin and all of its contents may be engulfed in flames (a.k.a. flashover point) and that once this point is reached, life inside the structure is in great peril because the fire’s further spread is inevitable”. (Compton, 2002, p. 119)

It is at the flashover point and thereafter that victim survivability is greatly reduced, if not completely eliminated and that the greatest strain is placed on firefighting resources both on a task level and in terms of quantity. Results obtained from the research identified these points as primary factors used for associating fire response with the flashover point. Therefore the six minute benchmark is commonly used as a measuring point for fire response times and resource deployment.

In a similar fashion, emergency medical response benchmarks are connected to a process entitled by the American Heart Association as the “chain of survival”. The chain of survival is used to describe the steps needed to positively impact survivability of a

cardiac arrest patient. Two significant links in the chain include early defibrillation and early advanced care. The early defibrillation link can be addressed through the use of automated external defibrillators such as units used by First Responder/Emergency Medical Technicians. The early advanced care link refers to use of Paramedic units to deliver advanced life support care in the field.

The basis for these links is tied to the scientific fact that "brain damage can start to occur in just four to six minutes after the heart stops pumping blood" and that it is statistically proven that "a victim's chances of survival after cardiac arrest are reduced by 7 to 10 percent with every minute that passes without treatment" (American Heart Association, 2006). The six minute benchmark is a common time base used to measure delivery of emergency medical services in order to intervene prior to the onset of irreversible brain death associated with cardiac arrest. Additionally, Results obtained from several sources inferred that rapid delivery and intervention of emergency medical services is critical not only for cardiac arrest patients but for many other medical conditions such as strokes, trauma, and respiratory emergencies. Simply stated, the longer a medical problem goes untreated the greater affect it has on the body and the greater the potential to lead to cardiac arrest or other detrimental physical damage.

The sixth research question of this ARP asks how the various standards/laws compare and contrast to one another. In terms of comparison, there are some commonalities between the theories behind the establishment of time. The commonalities are tied directly to the aforementioned information regarding flashover and brain death. The times referenced in NFPA 1710 and the Illinois Administrative

Rules are similar for emergency medical response in that times are expressed in a four to six minute response time window.

Another commonality exists between the federal laws and NFPA 1710 regarding personnel. Both bodies required the use of two in/two out whereby before two personnel enter a hazardous atmosphere, a minimum of two personnel shall be stationed outside the area with the atmosphere to provide rescue standby for interior personnel.

With regards to contrasts between the different standards/laws bodies, several significant points exist. The first and most distinct point is found with NFPA 1710. Of all the bodies, this standard is the only one that comprehensively details specific requirements for time benchmarks and resource requirements for all areas of emergency response. While the other standards/law bodies outline requirements, the requirements are only expressed for specific areas such as a time benchmark for emergency medical services or minimum numbers of personnel to perform tasks during a hazardous materials response.

Another contrast exists with the information outlined in the Insurance Service Office's Fire Suppression Rating Schedule. As it relates to the other standards/law bodies, it is the only one that utilizes mathematical formulas to express numerical values for manpower and resources. The results of these mathematical formulas are then translated into numerical ratings which then are categorized into a classification system of numbers entitled the Public Protection Classification. The numbers range from one to ten with the classification of one being the best.

The classification is then used to help determine insurance premiums for residential and commercial properties. According to Insurance Service Office's

information, “the price of fire insurance in a community with a good Public Protection Classification is substantially lower than in a community with a poor Public Protection Classification” (Insurance Services Office, 2005, p. 4). In this author’s opinion, the system can be best described as a reverse benchmarking process in that overall performance is first measured and then the result is compared to a benchmark versus first establishing a benchmark based upon existing industry standards/practices and then measuring comparatively or working towards it in a goal fashion.

The seventh Research question asks: “What should be the service level parameters for the Wheaton Fire Department?” The answer to this question lies in pulling together the common points of the standards identified in this research while threading the requirements set forth by the laws. It is important to incorporate the laws into WFD service level parameters in order to ensure compliance with these mandates. In regards to the laws, the parameters cannot be less restrictive than the requirements set forth in the law because in Illinois, as in most states, the local and state governments do not have the power to supersede the higher law making authority unless it is more stringent. In accordance with the guidelines of the Action Research method, the specific service level parameters for the WFD are outlined in Appendix B entitled *Service Level Parameters Policy*.

The final question raised in this ARP pertains to the expected potential impact that the service level parameters will have on both the organization and the community. The overall response to this question is based upon the opinion of this author and therefore will be addressed further in the Discussion section. On the most basic level, the

service level parameters will aid in gauging Department performance while ensuring that community needs are being met.

DISCUSSION

An extensive amount of information was identified regarding service level parameters both in the private and public sector. It was apparent that the private sector, specifically the business world, is adept to utilizing performance measurement as part of common practice. The business sector employs "broad metrics such as cost and customer satisfaction" as part of an effort to ensure that "to improve your business you must be able to truly verify that improvement" (Kurtus, 2000, ¶ 1).

The research clearly identified that the American fire service struggles with not only selecting which performance measurement principle is appropriate but also the actual employment of measurement practices. As a general perception much of the struggle can be tied back to money. On a low level, it is the money related to technology and expertise needed to process data but on a much higher level its the money related to meeting a particular standard such as the grading schedule parameters of the Insurance Services Organization or the requirements outlined in NFPA 1710. An excellent example of this problem can be found in the Boston Globe (Dedman, 2005) series of articles that reported issues related to response times and resources in northeastern United States.

A statement included in the article series also hit the nail on the head regarding the alleged reason why many American fire service organizations struggle with addressing the money problems and the service issues. Dedman (2005) quoted Ronny J. Coleman as saying "most fire departments don't know what their response deficiencies are – less that 1 percent have even a set standard".

The WFD has fallen victim of this same struggle. Included with this struggle was also what appeared to be a lack understanding of the creation and application of performance measurement or service level parameters. It is believed that many unanswered questions pertaining to the service that the WFD delivers will finally be able to be addressed through performance measurement.

The impact of service level parameters on the WFD is fairly broad. With standardized benchmarks, the WFD will be able to assess organizational facets that include whether it's response times are appropriate (i.e. from call receipt to service recipient contact), its personnel resources are adequate and/or efficiently utilized (i.e. fire ground staffing), and whether its current deployment plan (i.e. station locations) is effective. In years past, these facets were never truly assessed and as a result many perceptions/assumptions, by numerous stakeholders such as elected officials, administrators, and union members, exist about the state of the organization in relation to the facets.

The perceptions/ assumptions are divided in many cases amongst stakeholders. One stakeholder group has the perception that the Department needs additional personnel and is experiencing difficulty in maintaining appropriate response times. On the other hand, another stakeholder group perceives the Department to have adequate personnel and properly responding to requests for service. The views are at opposite ends of the spectrum and no one truly knows what is correct and what is wrong. The views are based upon feelings and emotions rather than measured data.

The WFD, under its current format, cannot factually address these positions. It is expected that defined service levels will positively impact the WFD by eliminating

perceptions/assumptions and providing data based proof to support either the maintenance of existing service delivery methods or the need to adjust service delivery methods.

If it is identified that adjustments are needed, this could lead to the following issues being raised: hiring of additional fire suppression personnel; expansion of emergency medical services(i.e. additional ambulance, advanced cross training for fire suppression personnel); construction of an additional fire station; expansion of fire prevention/public education/code enforcement services (i.e. increased fire inspections, residential fire sprinklers); technology applications (i.e. traffic pre-emption systems, computer aided dispatching, communications equipment); advanced employment of community planning/engineering practices (i.e. street construction, traffic management, zoning practices).

RECOMMENDATIONS

The research has identified that the WFD needs to utilize defined service level parameters in order to accurately assess both its current abilities and future needs. The following Recommendations are being outlined as possible actions to be implemented to aid in this effort:

1. The first recommendation is to formally adopt and implement, through the WFD and the City of Wheaton's administrative procedures, the *Service Level Parameters Policy* (Appendix B).

2. The second recommendation involves conducting an analysis of past National Fire Incident Reporting (NFIR) data for the WFD and comparing it to the adopted service level parameters in order to gain a historical perspective of performance. The

Department has limited, computer based, archival records and therefore the analysis would be limited to the timeframe of years 2003 through 2005.

3. The third recommendation is to develop and incorporate monthly quality assurance activities that incorporate analysis of NFIR data as compared to the service level parameters. The results of the quality assurance activities would be used to address immediate issues (if possible) and also be incorporated into planning activities such as budget development.

4. The fourth recommendation is to conduct an annual analysis of the compiled results from the third recommendation. The actions related to this recommendation would then be shifted toward the development of an annual report of service and the incorporation of the findings into strategic planning activities for the Department.

5. The fifth recommendation involves conducting further research and refinement of the Wheaton Fire Department's service level parameters. It is this author's opinion that it would be beneficial to the community and the Department to engage in the Standards of Response Coverage development process. The process would give the Department the ability to "customize" its service level parameters based upon the hazards within the community rather than just on standards/laws. The process would entail an extensive amount of work and time in order to properly obtain results. It could also result in additional expenditures for personnel and administrative purposes. However, the end product will be the creation of customized parameters that truly represent the local needs.

It is through these recommendations that the WFD can take steps to alleviate stakeholder uncertainty regarding its performance and its needs. The Department will be able to minimize misconceptions about the state of the organization and express its needs

in terms of facts. In the end, the community will benefit from enhanced planning efforts and a much clearer focus on the future of the organization.

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APPENDIX A

Technical Information Table

	NFPA 1710	**ISO**	**Federal Law**	**Illinois Law**
Fire Response Time Parameter	First engine company arrival – 4 minutes/Initial full alarm assignment within 8 minutes – to 90 percent of incidents	No set parameter – formula based calculations to determine rating	No set time parameter	No set time parameter
Emergency Medical Services (EMS) Response Time Parameter	First Responder with AED within 4 minutes/ALS within 8 minutes – to 90 percent of incidents	No set parameter – formula based calculations to determine rating	No set time parameter	Up to 6 minutes in primary response areas (level of service not specified)
Hazardous Materials Response Time Parameter	No set time parameter	No set parameter – formula based calculations to determine rating	No set time parameter	No set time parameter
Technical Rescue Response Time Parameter	No set time parameter	No set parameter – formula based calculations to determine rating	No set time parameter	No set time parameter
Personnel Deployment Requirements – Fire Suppression	Total personnel deployment number for initial alarm assignment denoted at 15 if an aerial device is used in operations (14 without aerial)	No set requirement – formula based calculations to determine rating	No total number noted but Respiratory laws (29CFR1910.134) requires the use and 2 in/2 out for entrance into IDLH atmospheres	No separate total number noted but the Federal Respiratory laws is adopted by reference by the Illinois Dept. of Labor laws

APPENDIX A

Technical Information Table

	NFPA 1710	**ISO**	**Federal Law**	**Illinois Law**
Personnel Deployment Requirements – EMS	Personnel deployed to ALS emergency responses shall include a minimum of two members trained at the Paramedic level – requirements shall be based upon on the minimum levels needed to provide care and member safety	No set requirements – no reference to emergency medical services delivery	No applicable laws	No total number noted – Specific staffing is addressed by individual medical systems – Wheaton Fire Department's medical system requires 2 Paramedics for ALS units
Personnel Deployment Requirements –Hazardous Materials	No total number noted – Reference made to requirements set forth in Federal laws.	No set requirement – no reference to hazardous materials response	No total number noted but HazWoper laws (29CFR1910.120) require the use of the "buddy system" and specific roles such as the incident commander to be filled	No separate total number noted but the Federal HazWoper laws are adopted by reference by the Illinois Dept. of Labor laws

APPENDIX A

Technical Information Table

	NFPA 1710	**ISO**	**Federal Law**	**Illinois Law**
Personnel Deployment Requirements – Technical Rescue	No total number noted – Reference made to requirements set forth in Federal laws	No set requirement – no reference to technical rescue response	No total number noted but specific laws such as Confined Space (29CFR1910.146) requires specific roles such as air monitoring to be filled	No separate total number noted but the Federal OSHA laws pertaining to Confined Space & Trench are adopted by reference by the Illinois Dept. of Labor laws

APPENDIX B

Wheaton Fire Department
Service Level Parameters Policy

Purpose: The purpose of this Policy is to outline the service level parameters in the categories of time and resources for the City of Wheaton Fire Department.

Scope: The provisions of this Policy shall apply to the Department service categories of fire suppression, emergency medical services, hazardous materials, and technical rescue response.

Definitions:
Turnout time – The time beginning when units acknowledge notification of the emergency to the beginning point of response time.

Response Time- The time that begins when units are en route to the emergency incident and ends when units arrive at the scene.

Policy:

General –
The existence of the Wheaton Fire Department was created through the charter and associated ordinances of the City of Wheaton. The Wheaton Fire Department provides both emergency and non emergency services to the community members both within the corporate limits, designated unincorporated areas, and areas of mutual/automatic aid response. Emergency services include fire suppression, emergency medical services, hazardous materials, and technical rescue response. Non emergency services include fire prevention, public education, and fire investigation.

The organizational structure of the Department shall include a Fire Chief and other staff as the City Manager shall determine. The current staffing of the Department includes thirty four fire suppression personnel, one civilian personnel, and eighteen contractual emergency medical personnel. The fire suppression personnel shall carry out all responsibilities related to emergency and non emergency services. The emergency medical personnel shall carry out all responsibilities related primarily to the delivery of emergency medical services and ancillary/support duties related to all other categories of emergency and non emergency services.

Time Objectives –
The *turnout time* for all emergency service responses for the Wheaton Fire Department should be one minute.

Fire suppression incident *response time* for the first arriving engine company should be four minutes or less and/or eight minutes or less for the deployment of the full first alarm assignment.

Hazardous Material incident *response time* for the first arriving engine company should be four minutes or less and/or eight minutes or less for the deployment of the full first alarm assignment.

Technical Rescue incident *response time* for the first arriving engine company should be four minutes or less and/or eight minutes or less for the deployment of the full first alarm assignment.

Emergency Medical incident *response time* for the first arriving emergency medical trained unit equipped with an automatic external defibrillator should be four minutes or less and/or six minutes or less for the arrival of an advanced life support emergency medical unit.

A compliance rate for the stated Time Objectives should be achieved for ninety percent of incidents for each emergency service category.

Resource Objectives-
Personnel resource allocation for Fire Suppression, when warranted based upon incident type (i.e. structure fire), should include the following:

- One, minimum, individual assigned to the task of incident command
- One, minimum, operator to establish and maintain an uninterrupted water supply for uninterrupted water flow application
- Two, minimum, personnel for each fire attack line and two, minimum, personnel for each back up attack line.
- One support person, minimum, per attack and back up line to provide assistance with task that include but are not limited to hose lays, utility control, and forcible entry.
- Two, minimum, search and rescue personnel to conduct a search of the structure and removal of victims.
- Two, minimum, personnel for ventilation assignments.
- If an aerial device is used in operations, one person shall function as an aerial operator who maintains control of the aerial device at all times.
- Two, minimum, personnel shall be assigned to the initial rapid intervention crew position on the fire ground until replaced by a dedicated rapid intervention crew. The said personnel can then be reassigned by the Incident Commander to other tasks.

Personnel resource allocation for Emergency Medical services should include a minimum of two Emergency Medical Technician – Paramedics for each advance life support unit. A minimum of one Emergency Medical Technician – Basic should be assigned to each fire suppression unit.

Personnel resource allocation for Technical Rescue and Hazardous Materials response shall include a combined response of on duty personnel who are trained to the awareness,

operation, and/or technician level in order to establish initial operations for support of advanced response from designated specialty teams.

Performance Evaluation –
The Wheaton Fire Department should conduct the following quality control and performance evaluation activities:

- On a monthly basis, Wheaton Fire Department's National Fire Incident Reporting data should be analyzed in comparison to the set time objectives. A report should be generated to document the findings.
- On an annual basis, the Wheaton Fire Department's National Fire Incident Reporting data should be analyzed in comparison to the set time objectives. Data pertaining to overall annual performance should be collected in conjunction with a historical comparison of performance. The results of the data collection should be included within an annual report of service for the Department.